Name _____ CM _____ Section _____

ME430 - Mechatronics

Examination I

January 4, 2010

Problem	Score
1	/ 8
2	/ 6
3	/ 20
Total	/34

For the written portion of the exam, you may use only:

- Any paper notes (such as notes on the videos) you brought to the exam, so long as those notes were written by you or your lab partner.
- A pencil/pen.
- A calculator (optional).

For the computer portion of the exam, you may use only:

- Your computer
- Any paper notes (such as notes on the videos) you brought to the exam, so long as those notes were written by you or your lab partner.
- Any electronic notes or code residing on your local (C:) hard drive, so long as those notes/code were written by you or your lab partner.
- The course website. (This is the only approved use of the internet for this exam.)
- A calculator (optional).
- ANGEL for code submission.

Anything not specifically allowed is prohibited. In particular, you may not use notes or code written by someone outside your lab group.

Problem 1 – Variable types:

Assume you have a 5 bit microcontroller where the basic variable type is a signed integer called a star. If a star is represented with 5 bits (signed) what is the largest positive value that a star can hold?

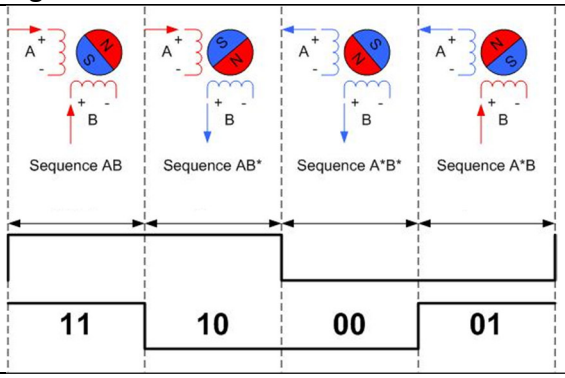
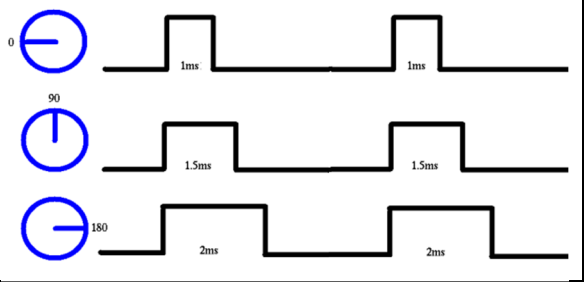
What is the largest negative number that a star can hold?

Fill in the 5 bits stored in memory for x, if x = 5:

Fill in the 5 bits stored in memory for x, if x = -7:

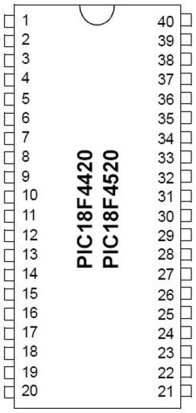
Problem 2 – Motors:

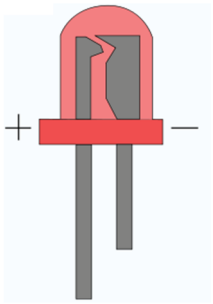
Indicate whether the signal line goes with a servo motor, stepper motor, or a gearhead DC motor.

Motor Type	Signal Line
_____	
_____	
_____	

Problem 3 – Resistor sizing BJT (NPN) & LED:

Assume you have a 15 volt supply and we want to use that power supply to run an LED at 80 mA. The LED has a 3.7 volt forward voltage drop. We would like to use a PIC's RBO pin to drive an (NPN) BJT to run the LED.





On the diagram above:

- Draw in the circuit for the transistor running the LED using the 15 V power supply.
- Show the calculations to size any resistors that are needed for the circuit. Choose standard E12 series (10%) size resistors and label them on the diagram.
- Connect RB0 on the PIC to the transistor circuit. You do NOT need to show other connections on the PIC (power, ground, etc.
- Show your work on the LED and BJT pictured, don't draw schematic symbols